Osteoimmunology of oral and maxillofacial diseases: Translational applications based on biological mechanisms

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The maxillofacial skeleton is highly dynamic and requires a constant equilibrium between the bone resorption and bone formation. The field of osteoimmunology explores the interactions between bone metabolism and the immune response, providing a context to study the complex cellular and molecular networks involved in oro-maxillofacial osteolytic diseases. In this review, we present a framework for understanding the potential mechanisms underlying the immuno-pathobiology in etiologically-diverse diseases that affect the oral and maxillofacial region and share bone destruction as their common clinical outcome. These otherwise different pathologies share similar inflammatory pathways mediated by central cellular players, such as macrophages, T and B cells, that promote the differentiation and activation of osteoclasts, ineffective or insufficient bone apposition by osteoblasts, and the continuous production of osteoclastogenic signals by immune and local stromal cells. We also present the potential translational applications of this knowledge based on the

biological mechanisms involved in the inflammation-induced bone destruction. Such applications can be the development of immune-based therapies that promote bone healing/regeneration, the identification of host-derived inflammatory/collagenolytic biomarkers as diagnostics tools, the assessment of links between oral and systemic diseases; and the characterization of genetic polymorphisms in immune or bone-related genes that will help diagnosis of susceptible individuals.

Biomarkers

 Maxillofacial

 Oral

 Osteoimmunology

 Periodontal disease

basic leucine zipper transcription factor

 C reactive protein

 cathepsin

 CXCL1 chemokine

 dextro tyrosylisoleucylcysteinylvalyl 1 methyltryptophylglutaminylaspartyltryptophyl n methylglycylalanylhistidylarginylcysteinyl n

 doxycycline

 doxycycline hyclate

 gelatinase B

 heat shock protein 27

 interferon regulatory factor 4

 interleukin 1

 interleukin 12

 interleukin 17

 interleukin 2

interleukin 22

interleukin 23

interleukin 6

interleukin 8

macrophage inflammatory protein 3alpha

neutrophil collagenase

Notch2 receptor

osteoclast differentiation factor

RANTES

reactive oxygen metabolite

rosiglitazone

serine proteinase inhibitor

stromal cell derived factor 1

tamibarotene

toll like receptor 4

tumor necrosis factor

unindexed drug

bone atrophy

bone destruction

bone metabolism

bone regeneration

cell activation

cell differentiation

chondrosarcoma

clinical assessment

clinical outcome

Ewing sarcoma

genetic polymorphism

gingivitis

human

immune response

immunology

immunomodulation

immunopathology

immunoregulation

maxillofacial disorder

mouth disease

nonhuman

ossification

osteoblast

osteoclast

osteoclastogenesis

osteosarcoma

periodontal disease

periodontitis

Review

tooth periapical disease

translational research